

ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR PCS LICENSED TRANSMITTER

Test Report No. : E123R-068

AGR No. : A122A-154

Applicant : SOLiD, Inc.

Address : 10,9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si,
Gyeonggi-do, 463-400, Korea

Manufacturer : SOLiD, Inc.

Address : 10,9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si,
Gyeonggi-do, 463-400, Korea

Type of Equipment : RDU MODULE (700LTE)

FCC ID. : W6UH700L

Model Name : 700LTE RDU44.5

Serial number : N/A

Total page of Report : 49 pages (including this page)

Date of Incoming : February 06, 2012

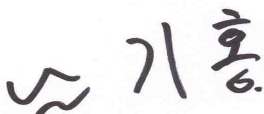
Date of issue : March 27, 2012

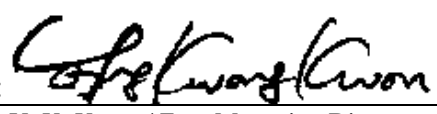
SUMMARY

The equipment complies with the regulation; **FCC Part 27 Subpart C.**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Prepared by: 
Ki-Hong, Nam / Senior Engineer
ONETECH Corp.

Reviewed by: 
Y. K. Kwon / Exe. Managing Director
ONETECH Corp.

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Revision History

Issued Report No.	Issued Date	Revisions	Effect Section
E123R-068	March 27, 2012	Initial Issue	All

1. VERIFICATION OF COMPLIANCE

APPLICANT : SOLiD, Inc.
ADDRESS : 10,9th Floor, SOLiD Space, Pangyoyeok-ro 220, Bundang-gu, Seongnam-si, Gyeonggi-do,
463-400, Korea
CONTACT PERSON : Mr. Kangyeob, Bae / Director
TELEPHONE NO : +82-31-627-6292
FCC ID : W6UH700L
MODEL NAME : 700LTE RDU44.5
SERIAL NUMBER : N/A
DATE : March 27, 2012

EQUIPMENT CLASS	PCB - PCS Licensed Transmitter
EQUIPMENT DESCRIPTION	RDU MODULE (700LTE)
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.4: 2009, EIA/TIA-603-C
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	PART 27 Subpart C
MODIFICATIONS ON THE EQUIPMENT TO ACHIEVE COMPLIANCE	No
FINAL TEST WAS CONDUCTED ON	3 m open area test site

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

2. TEST SUMMARY

2.1 Test items and results

SECTION	TEST ITEMS	RESULTS
2.1046(a), 27.50(b)	RF Power Output at Antenna Terminals	Met the Limit / PASS
2.1047	Modulation Characteristics	PASS (See Note 1)
2.1049	Occupied Bandwidth, Bandwidth Limitation	Met the Limit / PASS
2.1049	Band Edge	Met the Limit / PASS
2.1051, 27.53(c)	Spurious Emissions at Antenna Terminals	Met the Limit / PASS
2.1053, 27.53(c)	Field strength of Spurious Radiation	Met the Limit / PASS
2.1055, 27.54	Frequency Stability with Temperature variation	Met the requirement / PASS
2.1055, 27.54	Frequency stability with primary voltage variation	Met the requirement / PASS
1.1307(b), 27.52	RF Safety	PASS (See Note 2)

Note 1: The Equipment under Test (EUT) is a repeater which reproduces the modulated input signal, so the EUT meets the requirement

Note2: End users and/or installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance, because the applicant does not provide an antenna for sale with the EUT.

2.2 Additions, deviations, exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.3 Related Submittal(s) / Grant(s)

Original Grant

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 2.1.

2.5 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4: 2009 & EIA/TIA-603-C: 2004 and was performed at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The open area test site and conducted measurement facilities are located on at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. The Onetech Corp. has been accredited as a Conformity Assessment Body (CAB) with designation number KR0013.

3. GENERAL INFORMATION

3.1 Product Description

The SOLiD, Inc., Model 700LTE RDU44.5 (referred to as the EUT in this report) is a RDU MODULE (700LTE) that shall be plugged in RDU (Remote Drive Unit).

RDU devices are varied for each frequency band, including the following:

No	Unit naming	Description	Frequency	
			TX	RX
1	1900PCS RDU44.5	Single band	1 930-1995 MHz	1 850-1 915 MHz
2	850CEL RDU44.5	Single band	869-894 MHz	824-849 MHz
3	700LTE RDU44.5	Single band	728-756 MHz	698-716 MHz 777-787 MHz
4	AWS-1 RDU44.5	Single band	2 110-2155 MHz	1 710-1 755 MHz
5	700PS RDU44.5	Single band	758-775 MHz	788-805 MHz
6	800I/PS RDU44.5	Single band	851-869 MHz	806-824 MHz
7	900I RDU44.5	Single band	929-941 MHz	896-902 MHz

When receiving TX signals from each band through Remote Optic, RDU filters the signals and amplifies them with High Power Amplifier. The unit also filters RX signals given through cavity filter and amplifies them to send the signals to Remote Optic. In the unit, there is ATT to adjust gain. RDU consist of RFU, PAU and cavity duplexer and all modules are merged with one package. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	RDU MODULE (700LTE)
LIST OF EACH OSC. or CRY. FREQ.(FREQ. >= 1 MHz)	14.745 6 MHz, 8 MHz
EMISSION DESIGNATOR	D7W(LTE)
OPERATING FREQUENCY	728 MHz ~ 756 MHz
CHANNEL SEPARATION	5 MHz
RF OUTPUT POWER	44.5 dBm
DC VOLTAGE & CURRENT INTO FINAL AMPLIFIER	28 V, 10 A
ELECTRICAL RATING	AC 120 V
OPERATING TEMPERATURE	-10 °C ~ 50 °C

3.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3.3 Peripheral equipment

Defined as equipment needed for correct operation of the EUT, but not considered as tested:

Model	Manufacturer	FCC ID	Description	Connected to
700LTE RDU44.5	SOLiD Technologies	W6UH700L	RDU MODULE (700LTE) (EUT)	Signal Generator
SMJ100A	Rohde & Schwarz	N/A	Vector Signal Generator	EUT

3.4 Mode of operation during the test

The EUT was received signal form signal generator and then each modulation was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission. The applicant does not supply antenna(s) with the system, so the dummy loads were connected to the RF output ports on the EUT for radiated spurious emission testing.

For the above testing, following frequencies per channel were selected for each modulation.

Modulation	Channel	Frequency (MHz)
LTE	Low	733.00
	Middle	742.00
	High	751.00

4. EUT MODIFICATIONS

-. None

5. RF POWER OUTPUT at ANTENNA TERMINAL

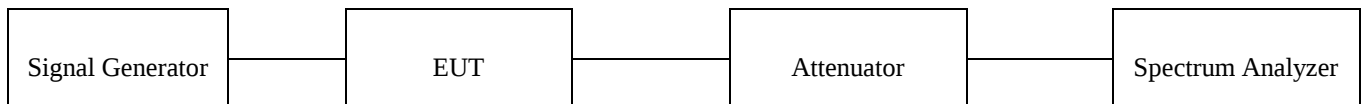
5.1 Operating environment

Temperature : 21 °C
Relative humidity : 52 %R.H.

5.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

RF output power was measured by channel power measurement function of the spectrum analyzer with rms detector mode.



5.3 Test equipment used

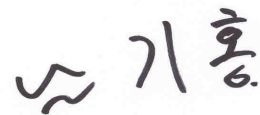
	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
□ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 02, 2012 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

5.4 Test data

- Test Date : February 15, 2012
- Measurement Function : Channel Power
- Detector Mode : RMS detector
- Test Result : Pass

Modulation	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
LTE	Low	733.00	-9.90	44.50	28.183 829	100.00
	Middle	742.00	-9.80	44.50		
	High	751.00	-9.80	44.50		



Tested by: Ki-Hong, Nam / Senior Engineer

6. OCCUPIED BANDWIDTH

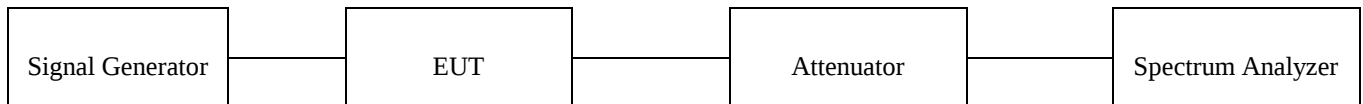
6.1 Operating environment

Temperature : 21 °C
Relative humidity : 52 %R.H.

6.2 Test set-up

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

For the testing, the RBW was set to 1 % to 3 % of the - 26 dB bandwidth. The VBW is set to 3 times the RBW and sweep time is coupled.



6.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
□ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 02, 2012 (1Y)
■ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

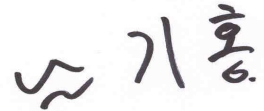
6.4 Test data

-. Test Date : February 15, 2012

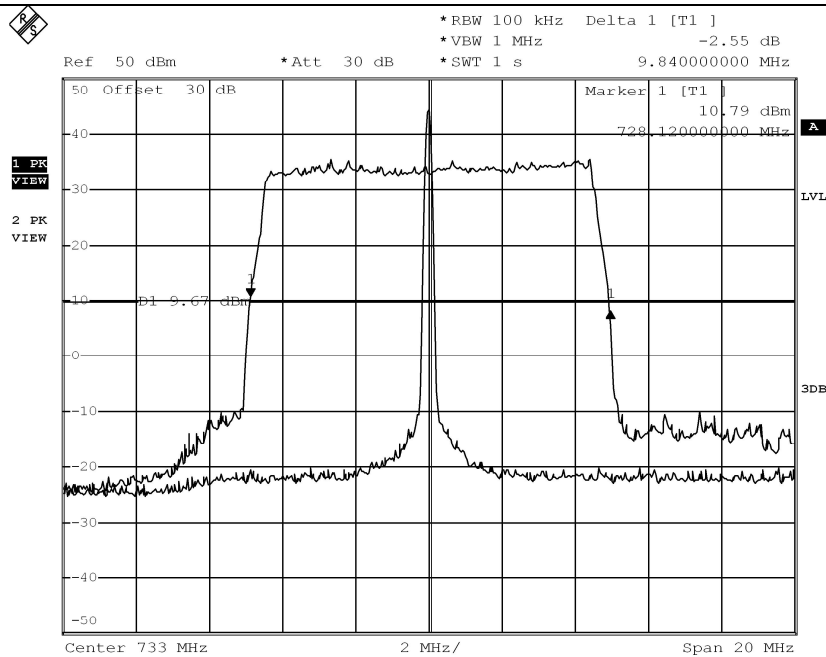
-. Test Result : Pass

Modulation	Channel	26 dB Bandwidth (kHz)	99 % Occupied Bandwidth (kHz)
LTE	Low	9 840	9 000
	Middle	9 880	9 000
	High	9 840	9 000

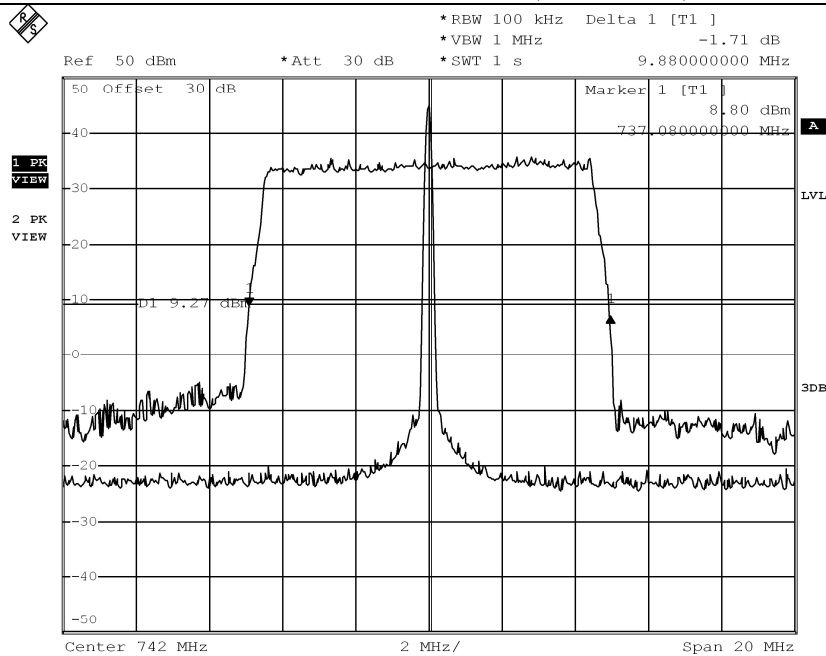
Remark: According to above result, the carrier frequency shall be within the frequency block edges.



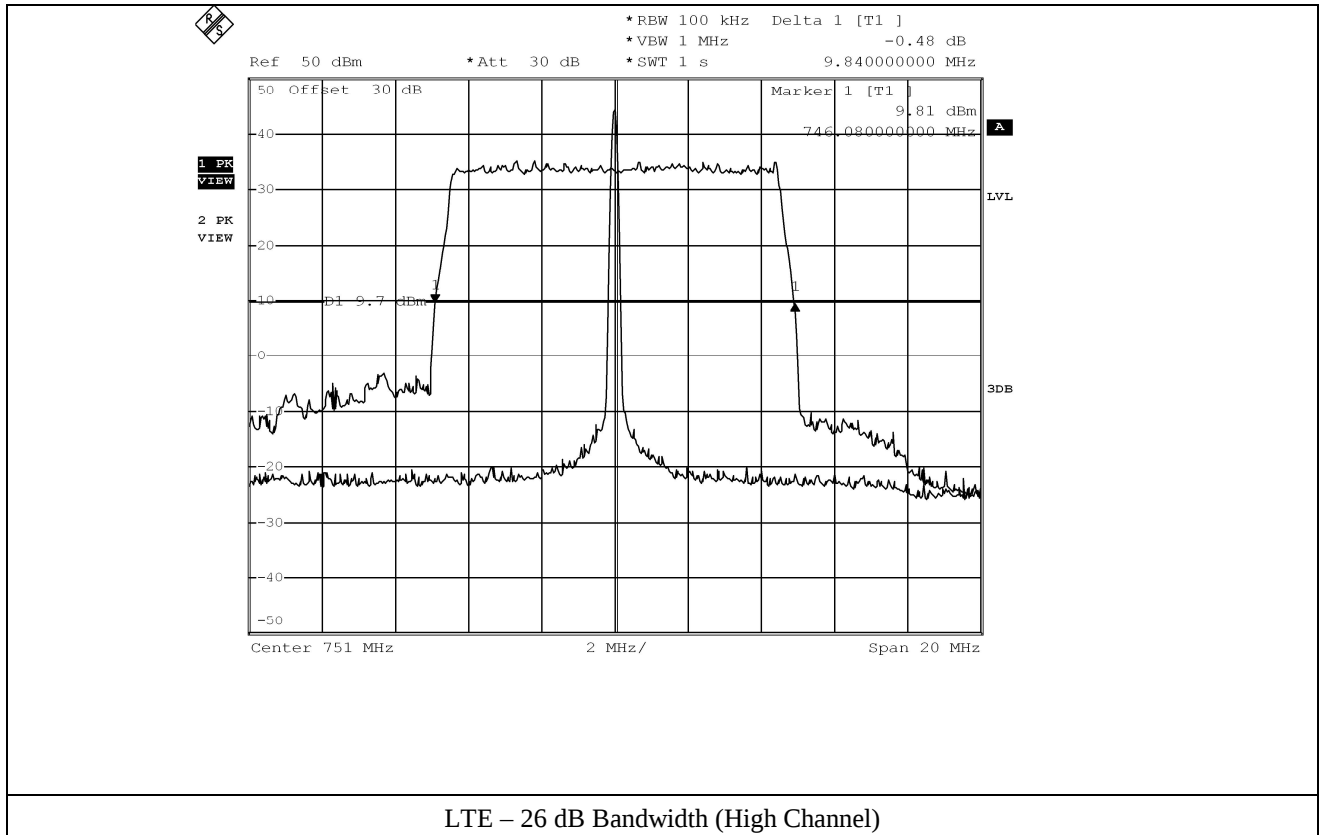
Tested by: Ki-Hong, Nam / Senior Engineer

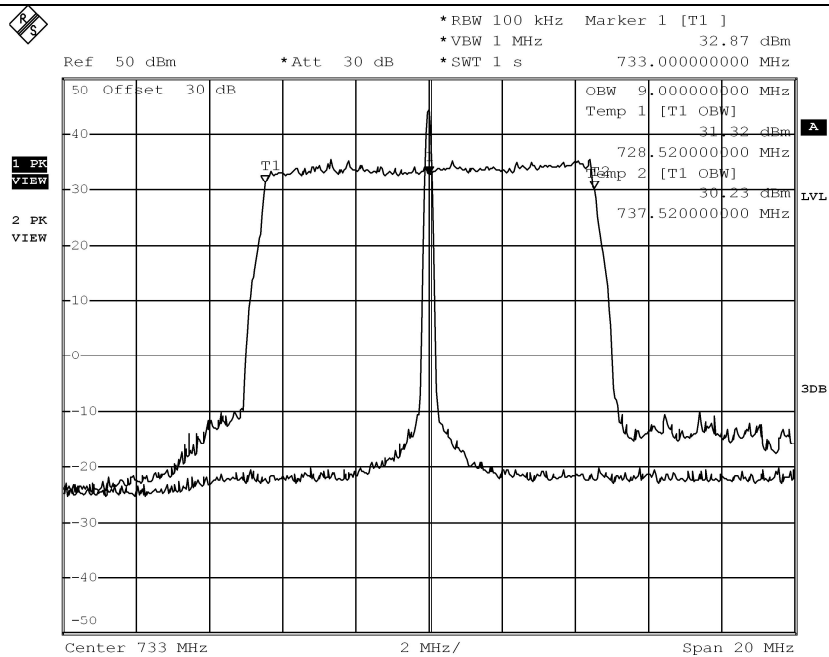


LTE – 26 dB Bandwidth (Low Channel)

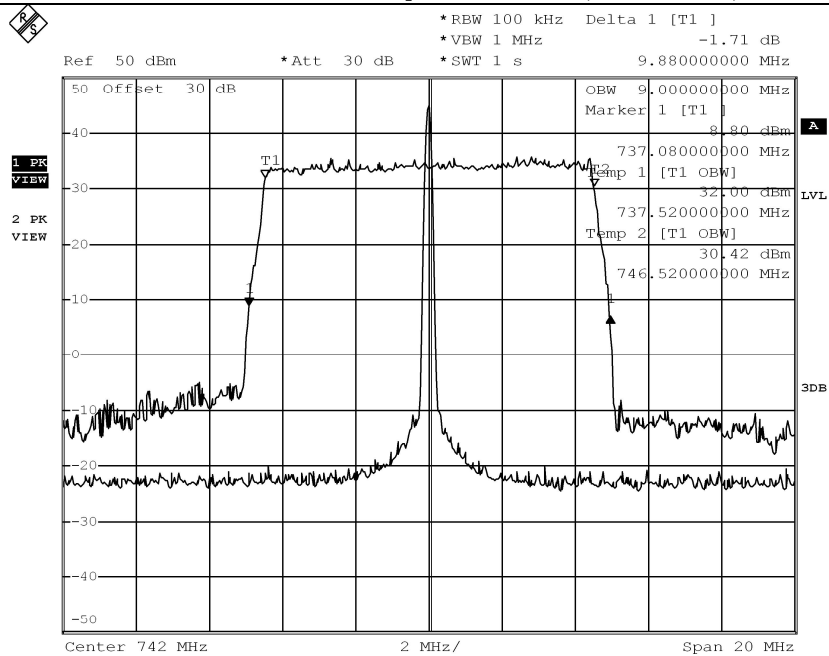


LTE – 26 dB Bandwidth (Middle Channel)

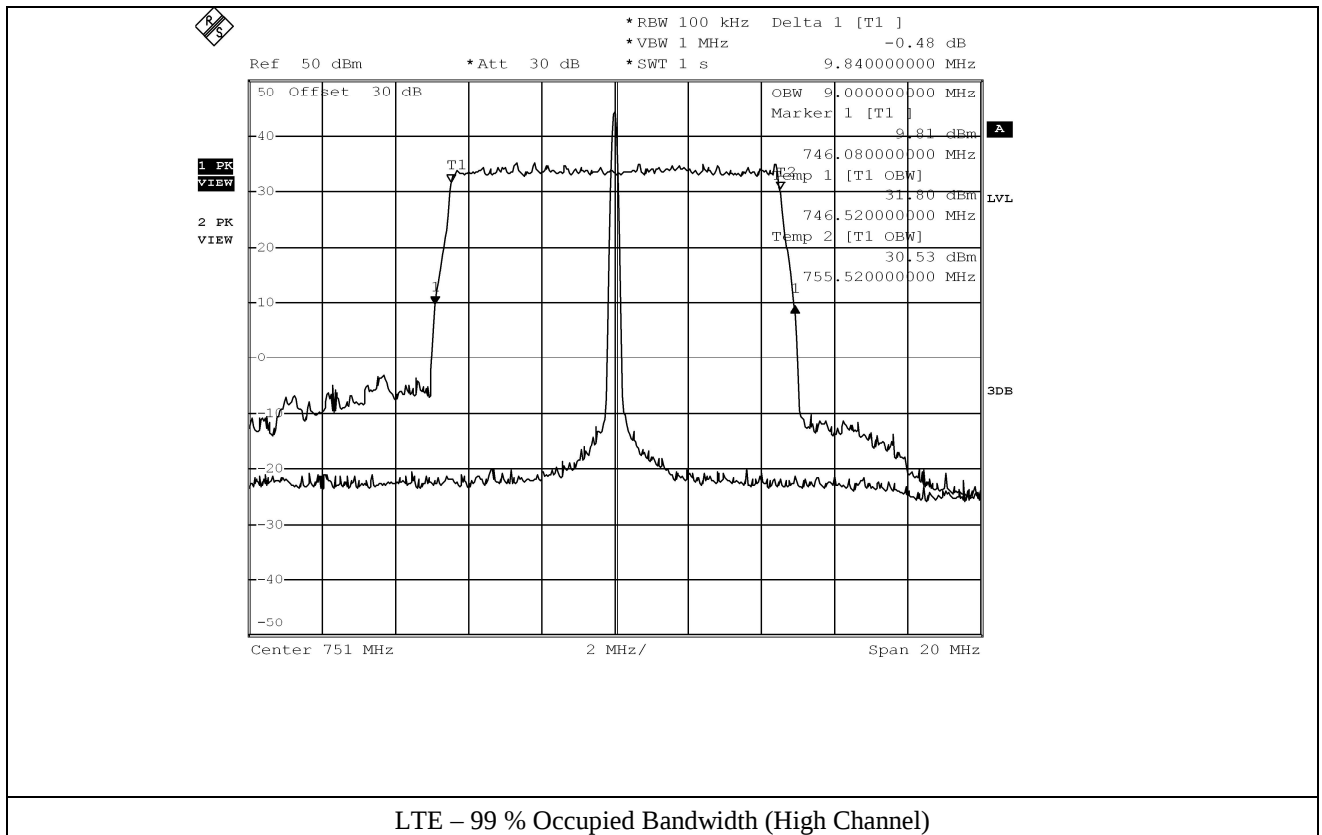


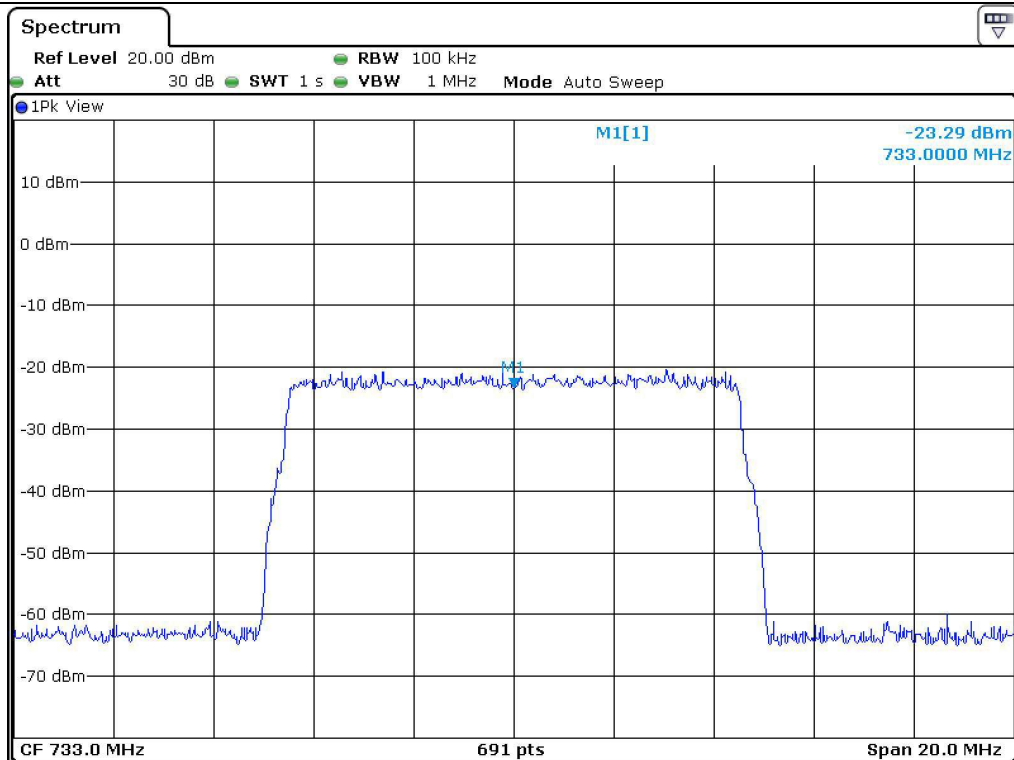


LTE – 99 % Occupied Bandwidth (Low Channel)

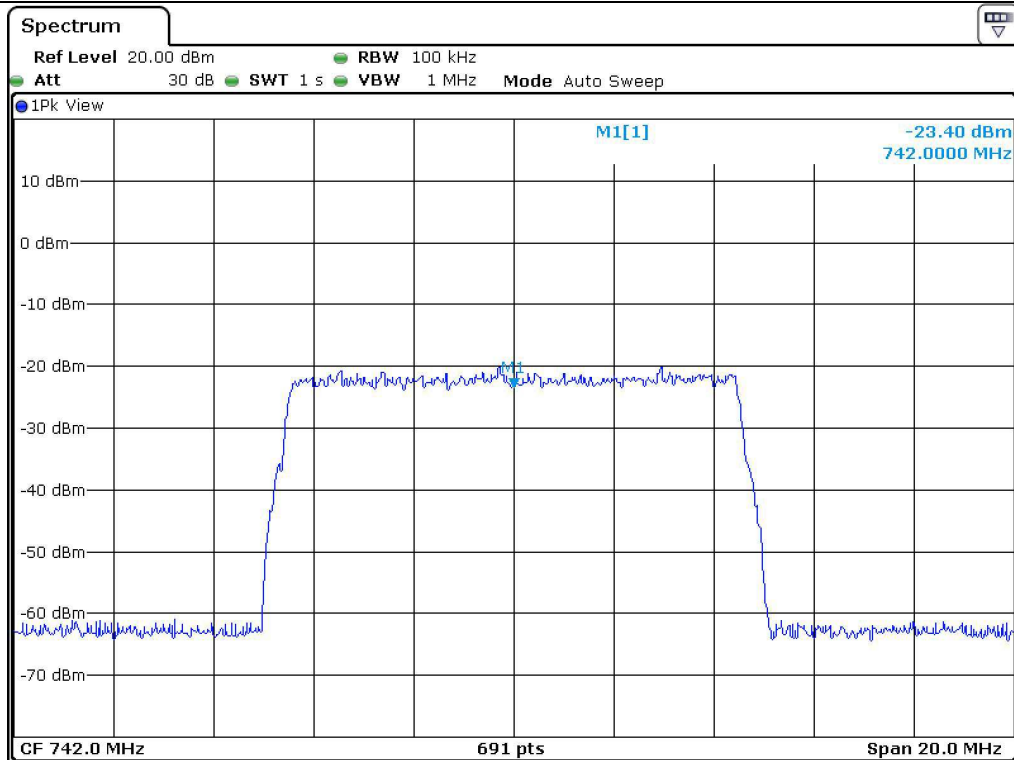


LTE – 99 % Occupied Bandwidth (Middle Channel)

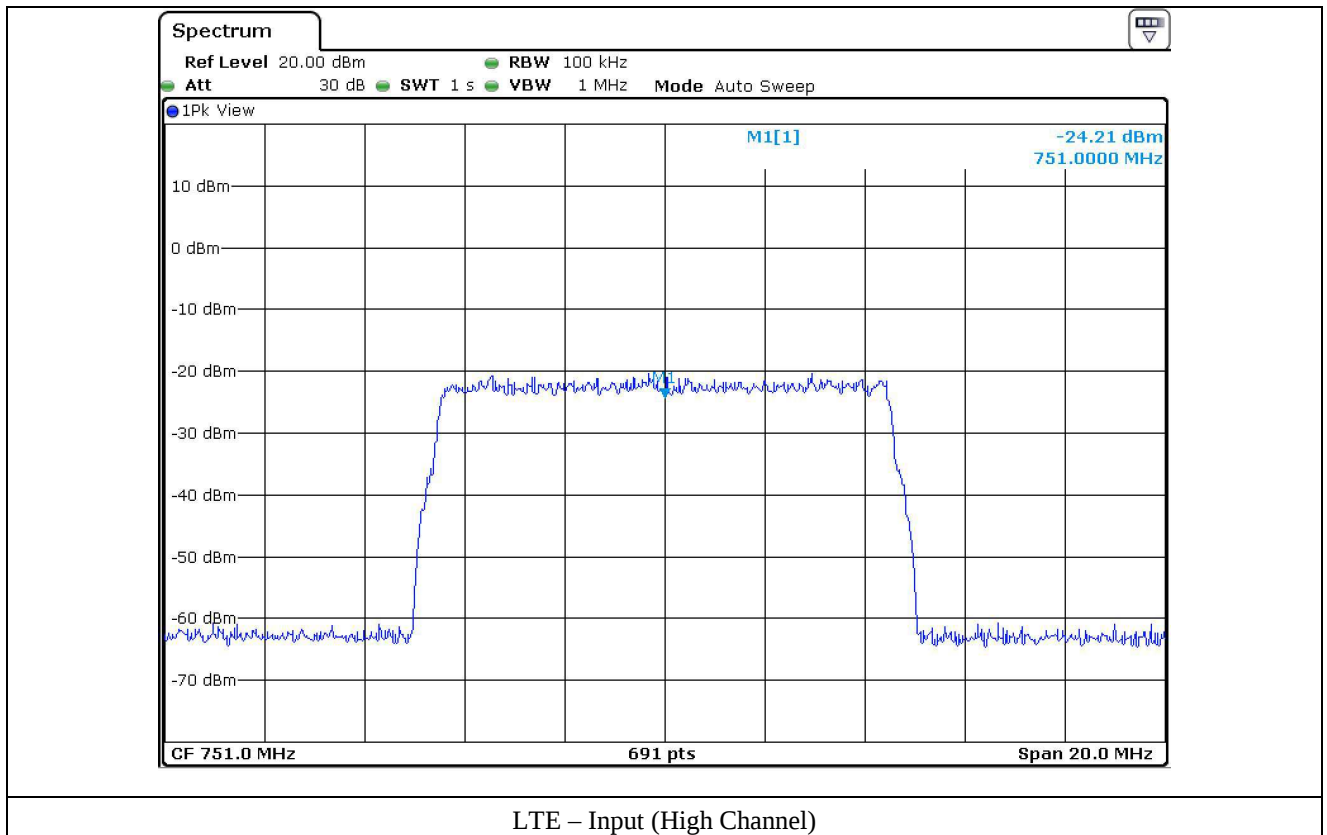




LTE – Input (Low Channel)



LTE – Input (Middle Channel)



7. SPURIOUS EMISSION AT ANTENNA TERMINAL

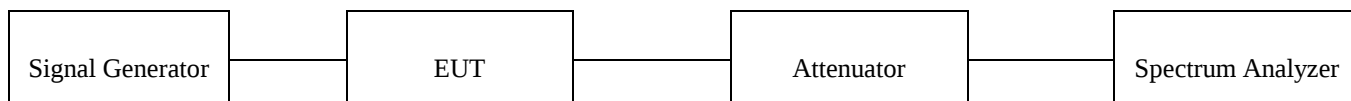
7.1 Operating environment

Temperature : 20 °C
Relative humidity : 51 % R.H.

7.2 Test set-up for conducted measurement

The RF signal from the signal generator(s) was injected to the EUT and the amplified RF signal at the output of the EUT was connected to the spectrum analyzer. The test was performed at three frequencies (low, middle, and high channels) at each band using all applicable modulation.

The resolution bandwidth and video bandwidth of the spectrum analyzer was set at 1 MHz and sufficient scans were taken to show any out of band emissions up to 20 GHz.



7.3 Test equipment used

	Model Number	Manufacturer	Description	Serial Number	Last Cal. (Interval)
□ -	E4432B	HP	Signal Generator	US38440950	June 10, 2011 (1Y)
■ -	SMJ100A	R/S	Signal Generator	101038	Feb. 01, 2012 (1Y)
□ -	FSP	R/S	Spectrum Analyzer	100017	Mar. 15, 2011 (1Y)
□ -	8564E	HP	Spectrum Analyzer	3650A00756	Jun. 10, 2011 (1Y)
■ -	FSV30	R/S	Spectrum Analyzer	101372	Aug. 29, 2011 (1Y)
■	WRCT 700/1000	Wainwright	Tunable Band Reject Filter	19	Oct. 21, 2011(2Y)
	-0.2/40-5SSK	Instruments GmbH			
■ -	67-30-43	Aeroflex Weinschel	Power Attenuator	CA5760	Nov. 30, 2011 (1Y)

All test equipment used is calibrated on a regular basis.

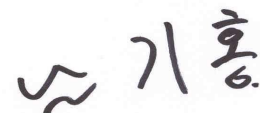
7.4 Test data

7.3.1 Test Result for §27.53 (c)(1)

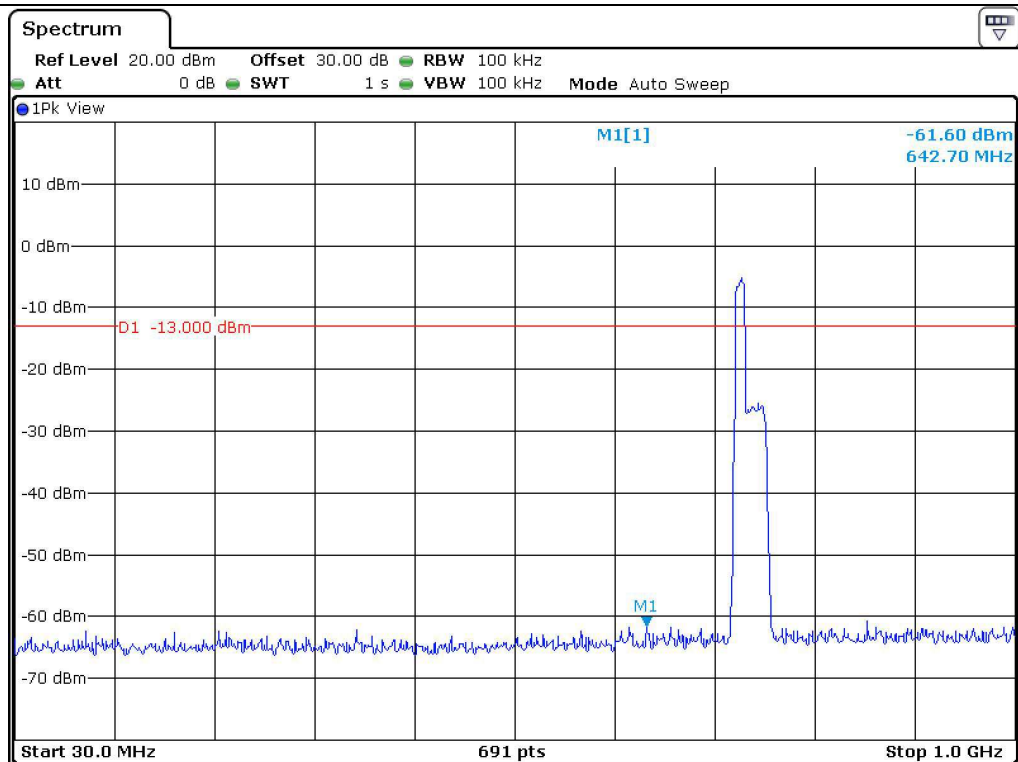
- . Test Date : February 16, 2012
- . Frequency range : 30 MHz ~ 10 GHz
- . Result : PASSED BY -24.96 dB at low channel

Channel	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	642.700	-61.60	0.50	-61.10	-13.00	-48.10
	7 844.000	-41.46	3.50	-37.96		-24.96
Middle	613.300	-61.61	0.50	-61.11	-13.00	-48.11
	7 844.000	-41.59	3.50	-38.09		-25.09
High	590.800	-62.17	0.50	-61.67	-13.00	-48.67
	7 844.000	-42.25	3.50	-38.75		-25.75
Other frequencies up to 10 GHz have margin more than 20 dB.						

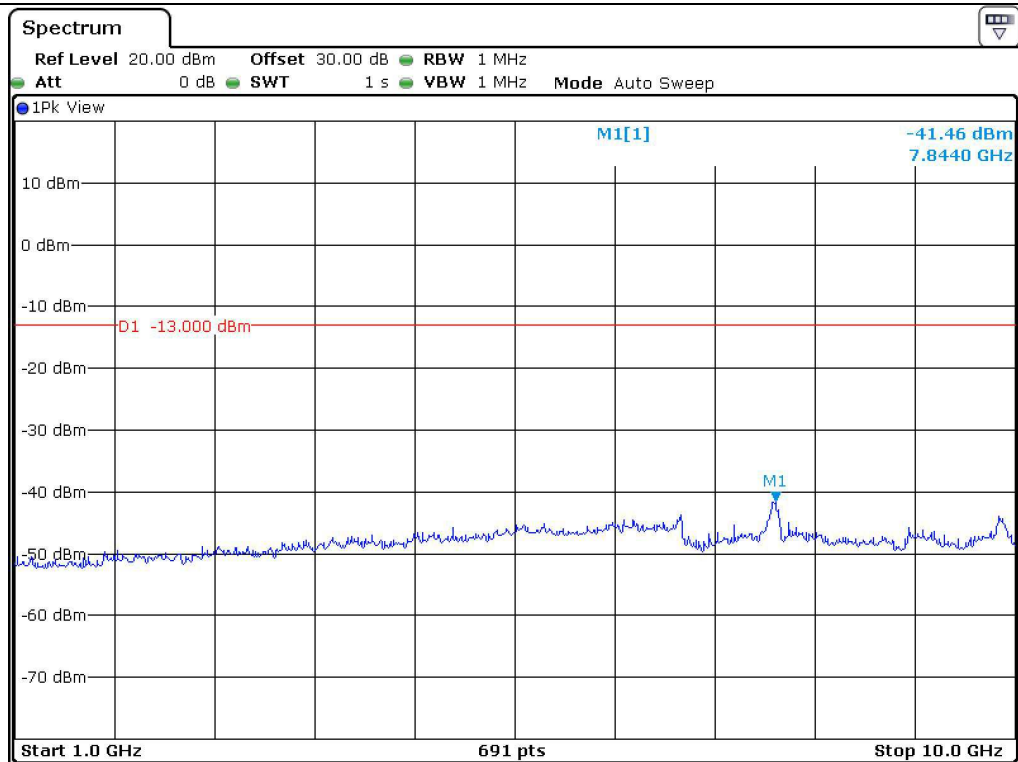
From CFR 27.53(c)(1): On any frequency outside the 746 MHz ~ 758 MHz band, the power of any emission shall be attenuated out side the band below the transmitter power (P) by at least $43 + 10\log(P)$ dB, resulting in a limit of -13 dBm.



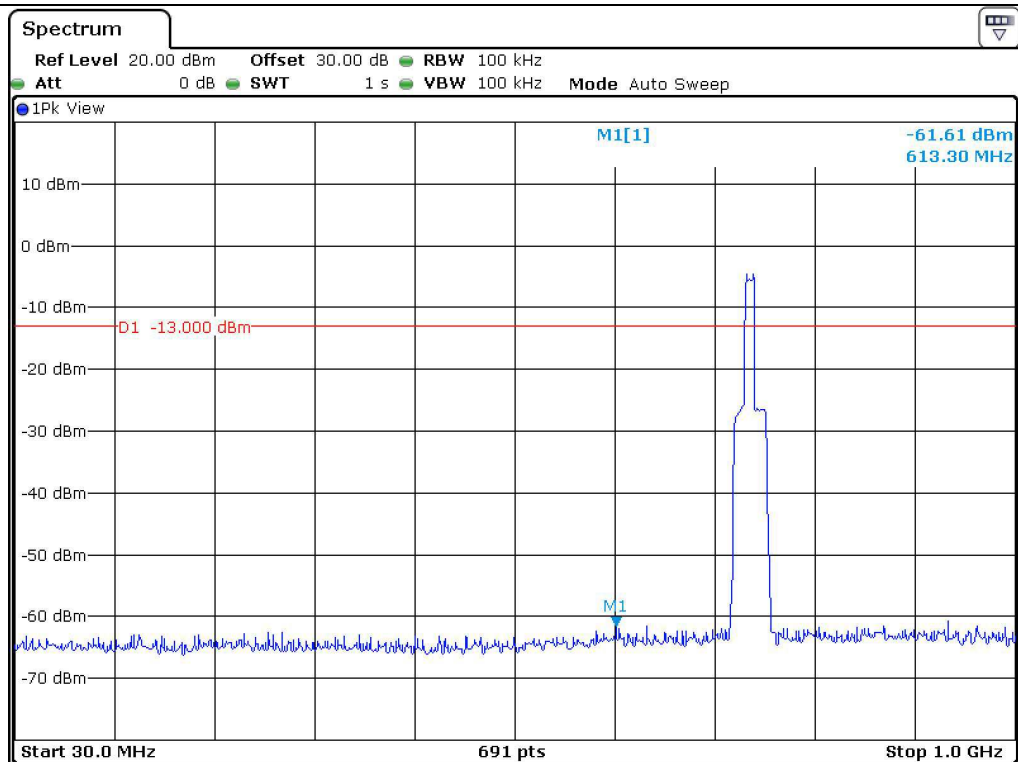
Tested by: Ki-Hong, Nam / Senior Engineer



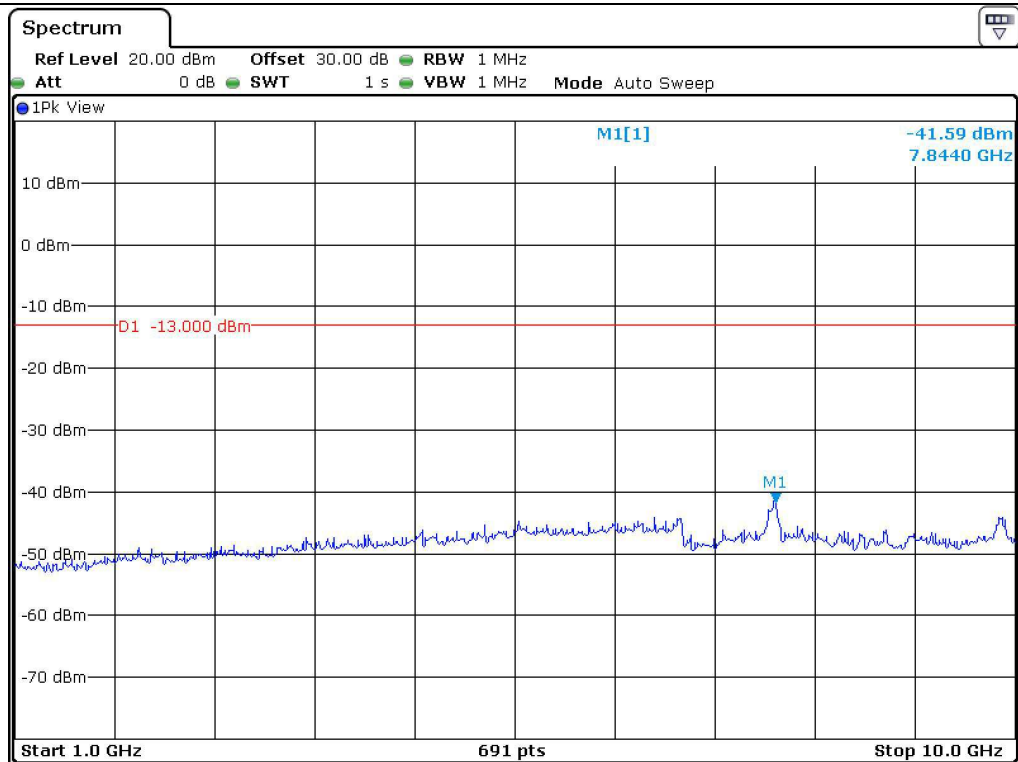
Low channel 1



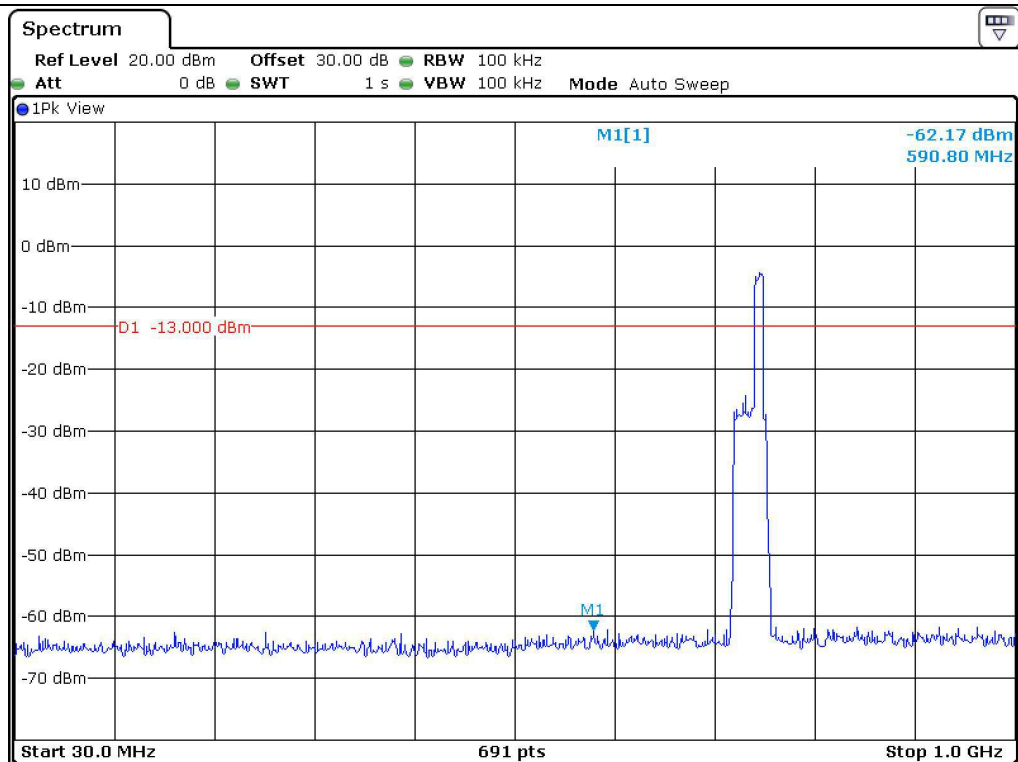
Low channel 2



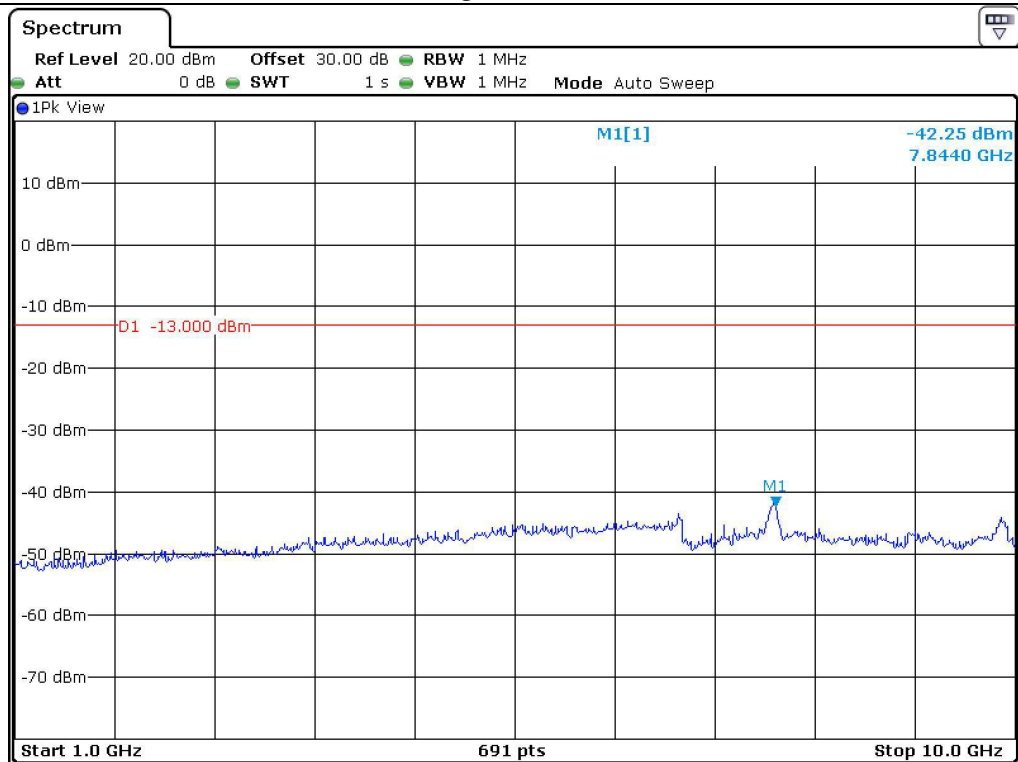
Middle channel 1



Middle channel 2



High channel 1



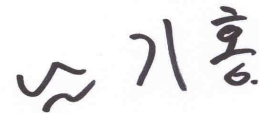
High channel 2

7.3.2 Test Result for §27.53 (c)(3)

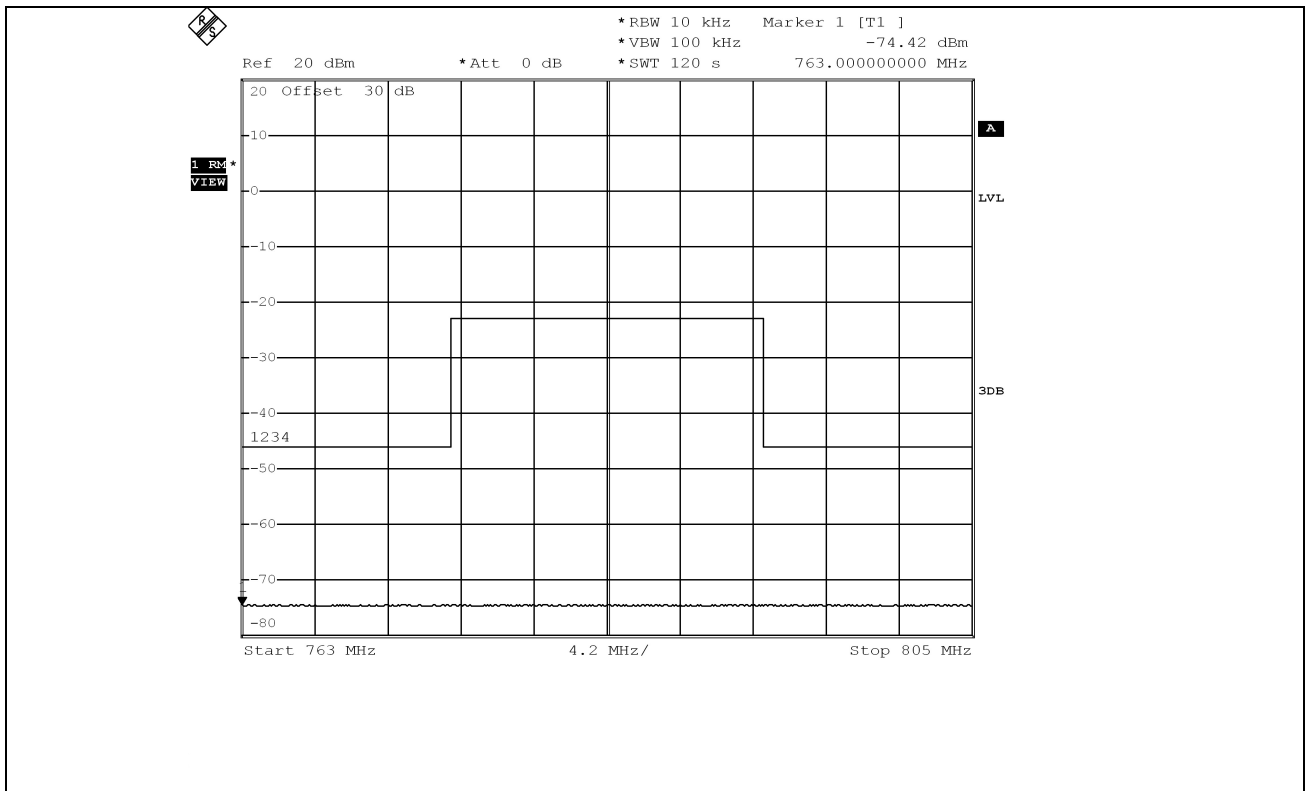
-. Test Date : February 16, 2012
 -. Frequency range : 763 MHz ~ 775 MHz and 793 MHz ~ 805 MHz
 -. Result : PASSED BY -14.54 dB at middle channel

Channel	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	763.000	-74.42	0.5	-73.92	-46.00	-27.92
Middle	763.000	-74.33	0.5	-73.83	-46.00	-27.83
High	763.000	-74.50	0.5	-74.00	-46.00	-28.00

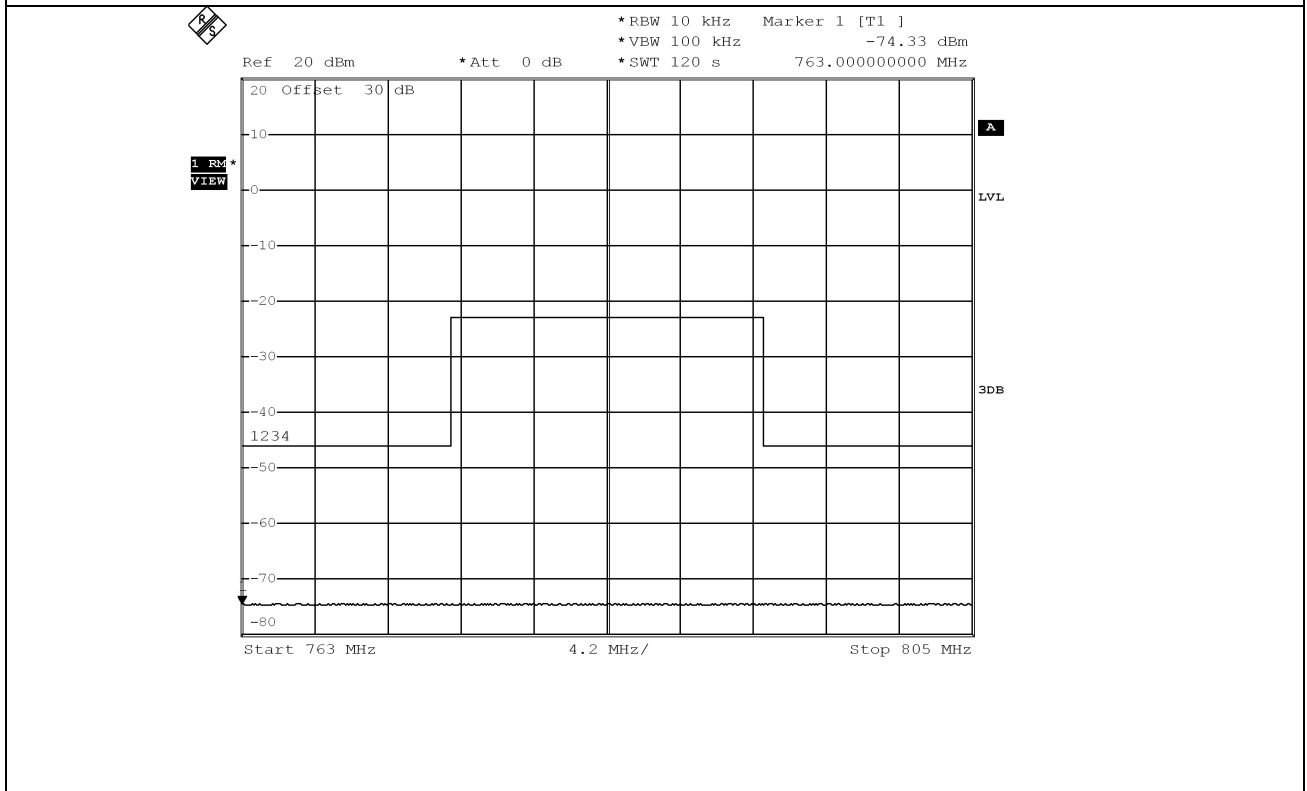
From CFR 27.53(c)(3)&(c)(6): On all frequency between the 763 MHz ~ 775 MHz and 793 MHz ~ 805 MHz, by a factor not less than $76 + 10\log(P)$ dB in a 6.25 kHz band segment, for base and fixed stations, resulting in a limit of -46 dBm (per 6.25 kHz measurement bandwidth)



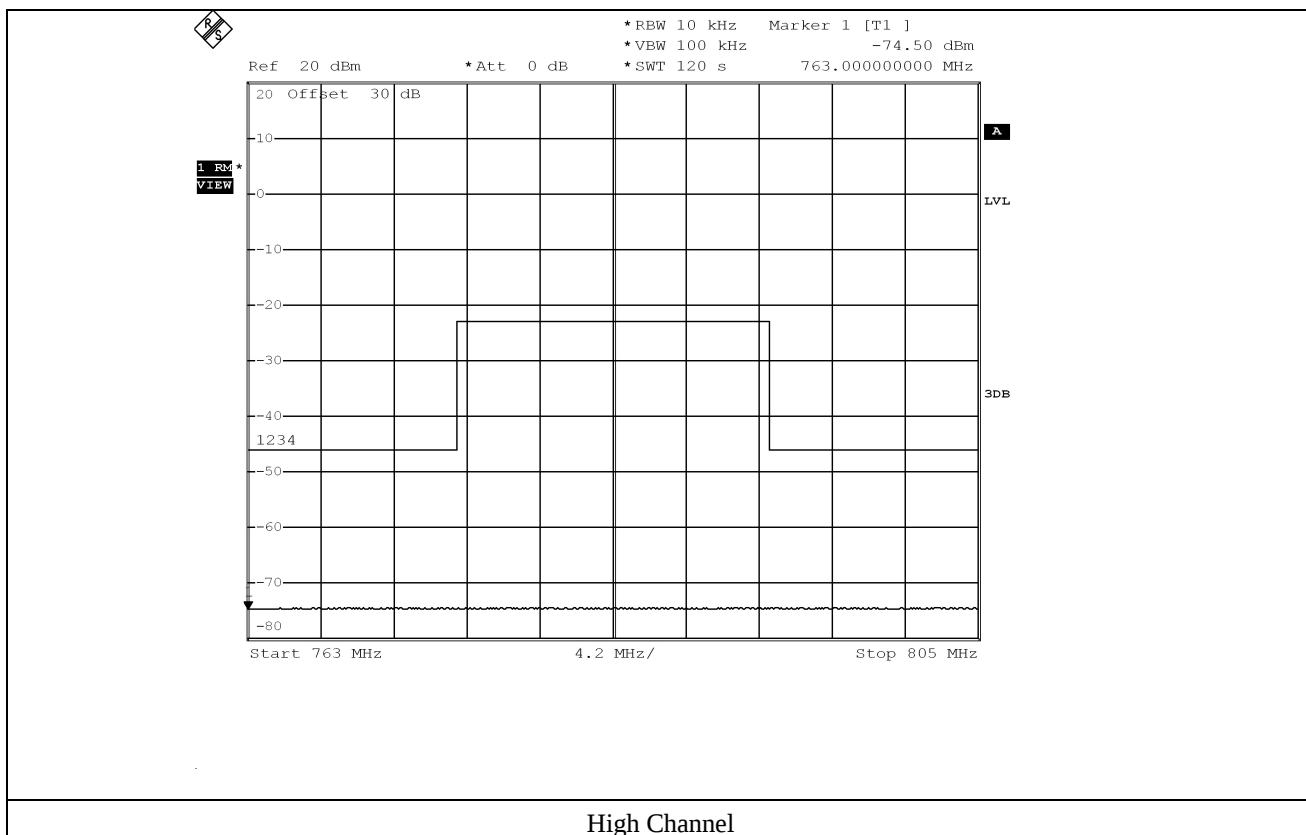
Tested by: Ki-Hong, Nam / Senior Engineer



Low Channel



Middle Channel

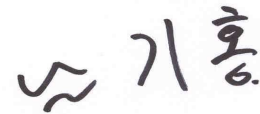


7.3.3 Test Result for §27.53 (f)

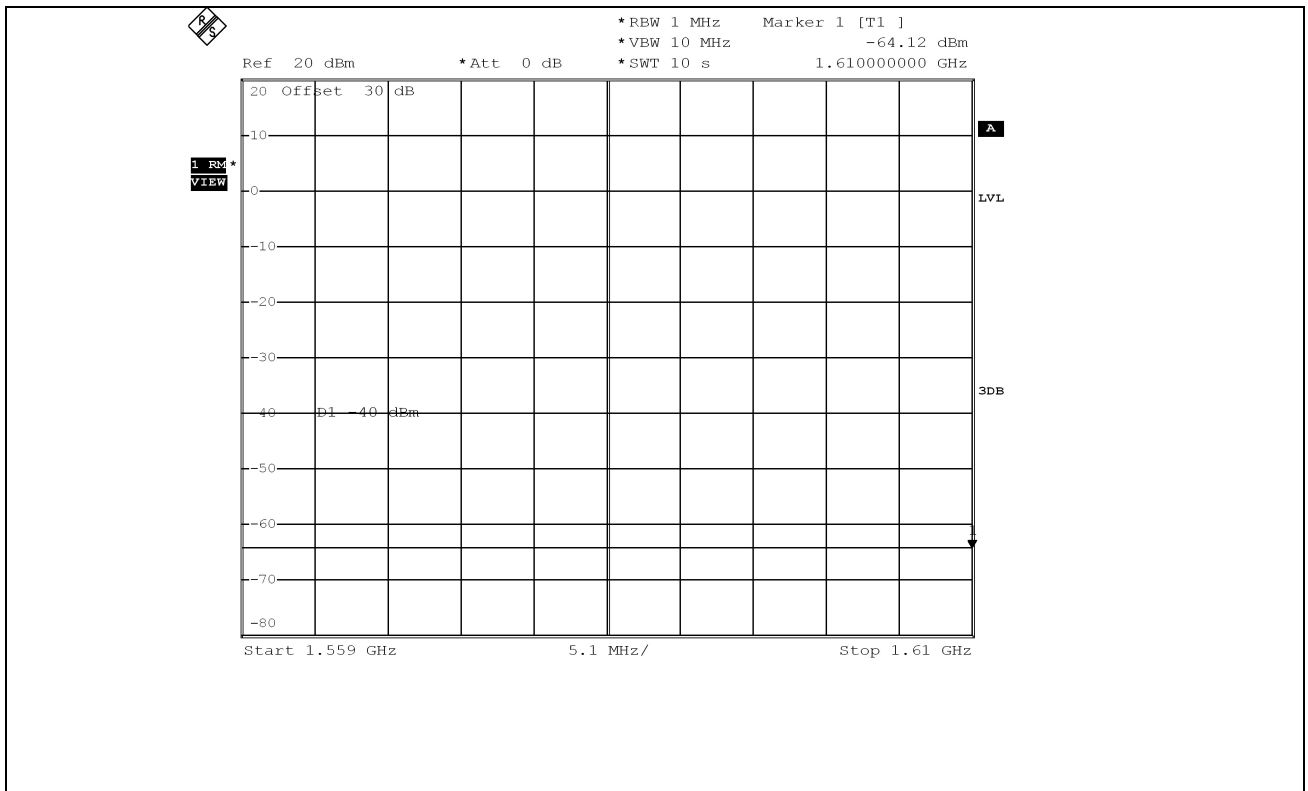
-. Test Date : February 16, 2012
 -. Frequency range : 1 559 MHz ~ 1 610 MHz
 -. Result : PASSED BY -22.89 dB at middle channel

Channel	Measured Frequency (MHz)	Measured Value (dBm)	Cable Loss (dB)	Total (dBm)	Limit (dBm)	Margin (dB)
Low	1610.000	-64.12	1.2	-62.92	-40.00	-22.92
Middle	1600.106	-64.09	1.2	-62.89		-22.89
High	1604.084	-64.10	1.2	-62.90		-22.90

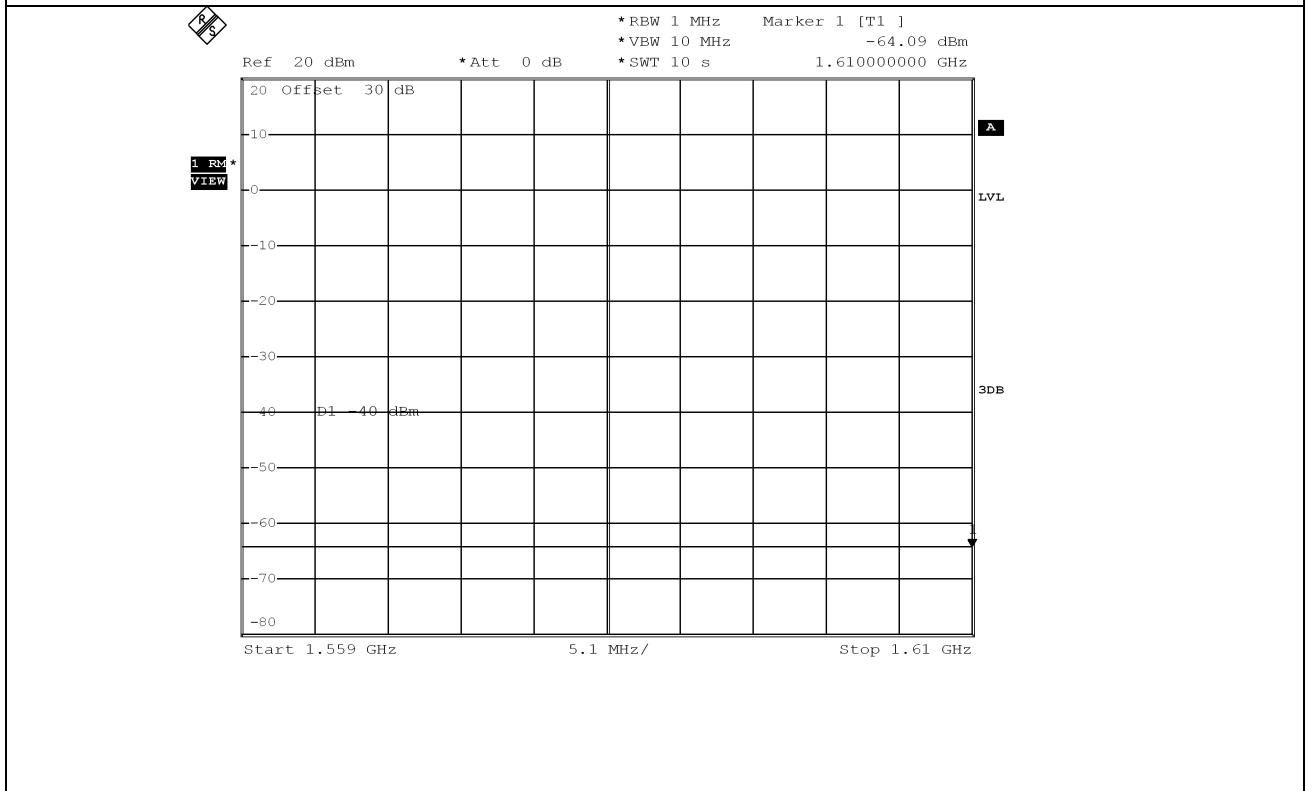
From CFR 27.53(f): For operations in the 746 MHz ~ 763 MHz, 775 MHz ~ 793 MHz, and 805 MHz ~ 806 MHz bands, emissions in the band 1 559 MHz ~ 1 610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.



Tested by: Ki-Hong, Nam / Senior Engineer



Low Channel



Middle Channel

